

ACTIVITY AND TIME USE DATA FOR ACTIVITY-BASED FORECASTING

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ABSTRACT

This paper, written from a practitioner perspective, briefly discusses model structure direction and implied needs. The models are categorized into two basic groups, activity pattern utility maximizing and micro-simulation approaches utilizing rule-based and satisficing heuristics. The four major possible sources of information for activity models: cross-sectional household (revealed preference), stated response, longitudinal panels and retrospective surveys are discussed, with the level of detail being higher for methods with short term applicability. The surveys are also discussed in the context of the two basic model categories. The conclusion is that both cross sectional and stated response are needed in the short term, that the use of cross sectional data alone may limit model development to utility maximizing models, and that the combined use of revealed and stated response is necessary for the development of micro-simulation models. Data collection methods are briefly discussed and consideration of direct contact interactive computer based surveys is suggested.

INTRODUCTION

I am a modeling practitioner at a Metropolitan Planning Organization (MPO). For the past several years we have been engaged in the development and deployment of surveys that will allow the introduction of either journey based (as distinct from trip based), or activity based models. My intention here is to examine the various approaches and data sources, and attempt to persuade, based on my experience and (slowly growing) awareness.

The stated purpose of this conference is to identify activity based techniques that can be used *now* by MPOs and state DOTs, and to recommend actions for advancing the state of the art of activity-based travel demand forecasting. The purpose of this resource paper is to demystify data needs for near-term application, and to suggest data needed for advances in the state of the art in activity based forecasting. The intention is to raise issues for discussion during this conference.

There is no intention of duplicating the detailed coverage of household travel surveys in the *Conference*

on Household Travel Surveys: New Concepts and Research Needs held March 12-15 1995 at the Beckman Center, Irvine, California. The proceedings have just been released by TRB (PROCEEDINGS 10).

MPO PERSPECTIVE

MPOs are, of course, far from homogenous and many will need to be more strongly convinced that trip based models are inappropriate for such things as TDM evaluation and mode choice analyses. There are two concerns that need to be addressed before even the more progressive MPOs will easily start activity model development and implementation.

The first concern is the perception that the academic community is leading the charge to move to a new paradigm (not necessarily true). There is a lack of a unified vision on the part of the academic community as to what is a reasonable way to proceed. This lack of a clearly articulated direction, and the competition among researchers, leaves the MPO practitioners confused and uneasy. Given the state of the art and the role of academics, to raise questions and suggest answers, this lack of a unified direction is perfectly reasonable.

I would suggest that the real problem is that the practitioners (public and consultant), are more concerned with maintaining the safety and security of current practice, than they are with the clear limitations of current practice. I think also, that most of us are so busy that there is little allocation of time to acquire an awareness of research that shows promise, and examples (overseas) of applications of this research. Perhaps we would achieve more if we see it as our (practitioners) job to develop a somewhat unified approach in the development of applications. Unless we do, trip based models will be with us for many more years.

The second concern comes from the fact that MPOs (and their consultants) are almost always in a production mode — modeling regional plan alternatives, conducting Major Investment Studies, trying to model TDM actions, doing air quality conformity evaluation. The flow of federal funds to a metropolitan region depends on this pipeline, and the flow of funds is the reason for being! It follows that a strategy of gradual replacement of the trip-based process — replacing elements of current models, and using adaptive models initially as an adaptation of the forecasts of the emerging regional models might be important. An effort to get some agreement on where we want to go and a clear plan for gradual implementation, a picture of the trajectory from the existing models to the new, would seem to be a worthy goal.

MODEL STRUCTURE AND NEEDS

It is axiomatic that the needs of the proposed model(s) drive the definition of data needed to support their development. This conference is about model structure development, with data needs becoming clearer from the recommendations that are made.

From the point of view of developing and choosing surveys, it is important to first visualize where models are headed. The needs today are for policy-sensitive models that can address transportation demand management actions in the context of how individual decisions are made. Issues include activities to be served, the arrangement of those activities into a daily and weekly pattern, the linking of out-of-home activity patterns into complex tours or journeys, and the consideration of the trade off between in-home and out-of-home locations for an activity. There is also the issue of interaction among household members. While this policy-sensitivity to management and control issues is well known and understood, an emerging concern is becoming important at the MPO level in the Pacific Northwest. That issue is growth, the management of growth, and the effect of the provision (or non-provision) of transport infrastructure and the effect of transport control strategies on growth and livability.

MODEL STRUCTURE

There appear to be two basic approaches to activity based modeling. While a superficial examination of these approaches would suggest the same basic data needs, a closer look reveals some important differences.

The more traditional approach considers a classification into patterns of activity and/or travel. This approach has used utility maximizing and nested logit more recently (for example, the Stockholm model — Algers, Daly, Kjellman and Widlert; and Ben-Akiva and Bowman). This approach has a long history, with STARCHILD (Recker *et. al.*) qtd. in Pendyala Kitamura and Reddy, - one of the first activity pattern based models; the journey or trip chain approach dates back to 1979 (Adler and Ben-Akiva).

A newer and more radical approach utilizes micro-simulation, and rule based and satisficing heuristics in models that seek to simulate the response or adaptation to change (in, for example, the urban infrastructure, transportation infrastructure, transportation pricing, congestion, family transitions). Examples of this latter approach include SCHEDULER (Garling *et. al.*) qtd. in Pendyala Kitamura and Reddy, SMASH (Ettema, Borgers and Timmermans) and AMOS (Pendyala, Kitamura and Reddy). This line of research seems to date from the mid 1980s. The microsimulation approach is consistent with the described (but not detailed) approach proposed in TRANSIMS (Los Alamos).

In practice, both approaches require a cross sectional base of daily activities and travel in order to implement a regional model of travel that reflects the aggregate effect of the disaggregate choices on the supply, and the effect of the ensuing changes in the supply side characteristics on the disaggregate choices (demand). While the utility maximizing approach also needs the revealed preference (cross-sectional) survey for model estimation, it is not clear that this is true for the micro-simulation/-heuristics/-satisficing approach.

DATA SOURCES

There are basically four possible sources of data/information with which to develop activity-based models:

1. A traditional cross sectional survey of household behavior, with minor embellishments to shed more light on the activities from which travel demand is derived.
2. A stated response survey, which investigates individual response to hypothetical variations in the behavioral environment. Stated preference is a subset of this group, using a trade-off exercise in a rigorous experimental design, in order to quantify the responses. Stated response has usually been applied to a limited market segment. Stated response can also be used to explore the existence and parameters of decision rules, which can be used to develop a set of activity plans or agendas which would represent the desired demand set, absent constraints. This might be the way to develop the synthetic activity-travel pattern for the planning region that can be used for the base in the application of adaptation models.
3. A longitudinal panel survey of activities and travel. In the short term, the transfer of adaptation/response to changes in the behavioral environment from an existing longitudinal panel survey is an important consideration. This data source may be the only one that is useful for the development of slow-response behavior such as household location decisions and automobile holdings transactions. Although retrospective surveys to determine decision rules may be quicker and more fertile.
4. A retrospective survey to investigate “slow” response behavior. I am not aware of the use of such a method in the transportation field. However, a household location decision is, in fact a joint consideration of location, auto acquisition and expected travel modes. Auto acquisition/disposition decisions are joint mode choice decisions.

What follows is a closer look at the four sources of data, with the most detail on the methods that are available for immediate application.

1. CROSS-SECTIONAL SURVEY OF HOUSEHOLD ACTIVITIES AND TIME USE

This survey is very similar to the traditional cross-sectional household travel survey, and in fact, the traditional travel survey has out-of-home time use. The classification of activities has been a very simple one, based on an expanded set of “trip purposes” - usually work, school, personal business, medical/dental, serve passenger, social/recreational, convenience shopping, comparison shopping, and eat meal, with the addition of “home” as an origin or destination of a trip.

There has been a gradual progression in the USA of expansion in the scope of the travel survey and a gradual transformation into a household activity survey. This started with the Boston and Los Angeles

surveys (1990-1991). Some recent (1994 to 1996) examples of surveys that have been expanded to include in-home activities (to some degree) are Portland, the Research Triangle (Raleigh-Durham-Chapel Hill), Honolulu, Dallas-Fort Worth, and Bay Bridge Corridor (MTC, San Francisco region). Of these, only Portland and the Bay Bridge surveys attempted a set of activities undifferentiated between in-home and out (with moderate success in the Portland case). There are two important points to be made:

1. *There is in fact a relatively small marginal increase in size and complexity for a full activity survey when compared with the data required in a traditional survey of travel behavior.* As an example, the Portland survey had a mean of a little over 15 activities per household per day, about half of which required travel (15+ activities, 9.2 at home, 5.8 away, with 8+ trips). The activity and time-use survey requires no more household data and no more person data than the travel survey (in Portland 200 items for an average household). The data collected for a trip consisted of an average 32 items, including address elements, or 256 per household per day average. The data collected on an activity with no travel consisted of 8 items or 74 per household per day and the data for an away activity (also 8 items) 47. This gives an average of 577 data items versus 503 items. The increased data collection to include activities thus added 15% in items recorded. (But does not add to the post treatment of address geocoding and the addition of modal impedances). An incidental benefit of this approach is that the focus on activities probably leads to better reporting of short auto trips and non-motorized trips (appears to be true in Portland).

2. *The data collected with the intention of building activity pattern models or activity sequencing and duration can also be used for the estimation of trip chaining (or tour based) models, or of traditional trip-based models.* There is no risk in the fall-back to a less ambitious model, the flexibility to do more has been built in at a marginal cost.

Given that medium-scale (2,000 to 15,000 households) household behavior surveys are typically undertaken only every 10 years or so, it is important to develop the survey in such a way as to maintain maximum flexibility in model development. It is important to consider a possible change in model paradigm.

From the point of view of building either simultaneous, utility optimizing models or sequential decision microsimulation models, the needs for data from the household activity survey appear to be nearly identical in terms of content (but probably not in the detail of that content). The same survey can be used!

DEMANDS ON INSTRUMENT

There are some extra demands on the design of the instrument to include possible activity model use. These include the classification of activities, the determination of the best practical way to obtain in-home activities and whether to include travel as a discrete activity.

Activity Classification

Ongoing surveys and analysis of time use by individuals outside of the transportation community exist (for example the work of John Robinson at the University of Maryland). To the best of my knowledge, none of this work has been done on the basis of all members of the household. However the existence of this source of secondary data suggests that an activity classification scheme that translates to a superset of the secondary data would be useful.

Research carried out on the Dutch panel data, and the Portland data (discussions with Kitamura and Golob) suggests that travel time increases for the commute are traded off against truly discretionary time: recreation, either in-home or out and household maintenance (chores). The scheme used for Portland is an example of an attempt to create a scheme that allows more insight into trade-off behavior by using a richer set of activity classification than traditional travel surveys. At some point this approach would lend itself to evaluation of the change in quality of life as a way of considering transportation issues. Portland Scheme:

The Portland activity data was collected open-ended and coded to the following set by the interviewer.

Household Sustaining

Meals
Work
Work-Related
Shopping (General)
Shopping (Major)
Personal services
Medical care
Professional services
Household or personal business
Household maintenance
Household obligations
Pick-Up-/Drop-Off passengers

Social Activities

Visiting
Casual entertaining
Formal Entertaining

Personal Enrichment

School
Culture
Religion/Civil Services
Civic

Recreation and Other Diversions

Amusements (at home)
Amusements (Out of home)
Hobbies
Exercise/Athletics
Rest and Relaxation
Spectator Athletic Events
Out of area travel

Other

Incidental travel
Tag along travel

In-Home Activities

There has been considerable discussion on this issue in the development of recent household surveys in the US, with no closure. The practice ranges from no in-home activity classification (obtained in a traditional

travel survey) to an attempt to get all in-home activities (e.g., Dutch Panel — all, and Portland — for activities whose duration was greater than 30 min.).

The acceptance of the concept of the modeling of activity sequencing and duration, together with the choice of location and travel (if out of home) requires an accounting for time from waking up to sleeping at the end of the day. The level of detail of in-home activity classification is an important item for discussion. However the approach used in Portland, attempting to get great detail, led to problems with completing the survey until a threshold of greater than 30 min. time use was introduced. Using the 30 min. threshold led to non-reporting of meals, and large amounts of unspecified time, some of which (like eating) could be done inside or outside the home. The Research Triangle survey dealt with this by only requiring detailing of time used in-home for things that could be optionally done away from home, the rest being lumped into an other category.

Travel As An Activity

The activity surveys preceding the Dallas-Fort Worth survey treated travel as a means, not as an activity in itself. The format was to ask the following information: the first activity of the day, then ask if it included travel, if so, details on the trip were collected; then.... “what did you do next”, and ask if travel were needed ... etc. It was noticed during the Portland survey that respondents had difficulty with the concept of travel not being an activity. When the North Central Texas Council of Government’s (Dallas-Ft. Worth) household survey was extensively pretested, the same problem was noticed and the questionnaire re-cast with travel as an activity. This instrument is currently in the field.

INTRINSIC LIMITATIONS

The primary limitation of a cross-sectional survey is the assumption that cross-sectional differences in response in many individuals to different situations can be extrapolated into a longitudinal response of specific individuals to a changed situation, which raises questions for TDM policy analysis. If this is not true, questions about temporal stability are raised.

The second limitation is the lack of variation in some specific key variables. The primary variable here is the cost of driving and transit fare. Out of pocket costs of driving are primarily fuel based — constant, the major differences being in fuel economy of the car chosen — rarely included in data for model estimation, and more difficult to include in model application (how do we know which car would have been used by non-car choosers?). In reality the type of car acquired and the number of cars acquired are (or should be) endogenous not exogenous variables, and are a function of fuel price, among other things. For many MPOs the only other car-based cost is parking, in a limited number of activity locations. Transit fares in most US cities are fairly flat, being zone based with discounts for passes. Only a few cities (such as the San Francisco area) have the multiplicity of transit suppliers and the number of tolled bridges that will provide rich enough data on user costs in terms of money.

INTRINSIC STRENGTH

Many regions have recent data from such surveys, with varying levels of in-home activity coverage. These surveys are usually large enough to reveal a large number of different activity patterns, which can be used as a basis for at least an out of home activity pattern based model. Surveys of this type take a minimum of a year to design and field, with another 6 months to get clean the data and append the level of service and accessibility data necessary for model estimation. (This would be an optimistic/aggressive scenario). They can be designed, fielded and used to prepare models within a 2-year time frame. This would have to be the primary source for models that can be implemented now.

2. STATED RESPONSE

This is a collection of methods that can be deployed in a relatively short time frame, and a very promising source of data for the development of activity based models which take into account adaptation, (heuristic) rule based decisions and satisficing. There is a confusion of terms and vocabulary. It is useful to consider the taxonomy suggested by Martin Lee-Gosselin, shown in the following table.

Taxonomy of stated response surveys: Martin Lee-Gosselin

GENERAL USES	CONSTRAINTS		
	(expressed as attributes, personal,/household/social/spatial/supply, etc.)		
		<i>Mostly Given</i>	<i>Mostly Elicited</i>
	<i>Mostly Given</i>	STATED PREFERENCE (focus = tradeoffs, utility) “Given the level of attributes in these alternatives, which would you prefer: [A]....? [B]....? [C]....? etc...”	STATED TOLERANCE (focus = limits of acceptability and thresholds for change) “Under what circumstances could you imagine yourself doing: [r1]....? [r2]....? [r3]....? etc...”
		STATED ADAPTATION (focus = reactive and trial behavior; problem solving)	STATED PROSPECT (focus = learning processes; information seeking; the

<p><i>Mostly Elicited</i></p>	<p>behavior; problem-solving, rules)</p> <p><i>“What would you do differently if you were faced with the following specific constraints: [...detailed scenario]”</i></p>	<p>imaging, formation and testing of choice sets; metadecisions)</p> <p><i>“Under what circumstances would you be likely to change your travel behavior and how would you go about it [...broad context]”</i></p>
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For use in utility maximizing activity models, the formal stated preference approach, with an orthogonal trade-off design has the advantage of quantitative integration with revealed preference. The disadvantage is the difficulty of dealing with complexity of response choices. For example, even without consideration of interaction among household members, a design that in response to (say) congestion pricing can both include the response in the trip (change mode, change destination, change time of day, not take trip) and the alternatives in activity chaining and activity patterns and duration of activities, yields a set of combinations that is impractical.

The real promised strength of stated response is in the formulation of heuristic, rule-based models of adaptation. This has applicability to the policy analysis of control strategies, but to a large extent is still firmly rooted in academic research. Introduction of these techniques into a model paradigm that considers the interaction and feedback between demand and supply has not yet been demonstrated.

The other probable major role for stated response is in the generation of a daily (or weekly) activity-travel “plan” or “agenda” – the desired set of activities contemplated by the person or household. This base pattern is usually assumed to be developed from the revealed preference household activity survey (factored), which in fact displays already constrained choices, or to be generated synthetically. In most of the adaptive models this base pattern is heuristically modified until an acceptable and practical activity pattern is found, following the introduction of some change. In the case of the proposed TRANSIMS formulation this is then modified further following the feedback of the aggregate effects of all decision makers on the system.

For policy analysis in terms of response to TDM actions, this technique is relatively quick to deploy and to develop a model response to actions affecting a specific market segment. The most recent application of this type in the US has been in the development of TDM response on the part of commuters to various policy changes in the Washington DC metropolitan area. This was described as a stated preference survey and was fielded using Computer Aided Telephone Interview (CATI) methods — which meant the sequential rather than parallel (simultaneous) consideration of choices. The results of this survey were used to calibrate the initial element of AMOS, demand response to TDM actions, using neural networks of behavioral adaptation (Pendyala, Kitamura and Reddy). In terms of the Lee-Gosselin taxonomy, this survey could perhaps be described as Stated Adaptation, or on the border between SP and SA. The other example, which will be discussed later, is the Adelaide Travel-Activity Questioner (ATAQ) — (Jones,

Bradley and Ampt), which was an early example of joint RP/SR, considering stated adaptation with the activities of all members of the household.

My own view is that this area (stated response) is likely to give us the most effective way of getting information for new activity-based models in a reasonable time period. However, because of complexity, it will mean a move away from the quantitative SP to more qualitative flavors of stated response. The issue here is that transport modelers are (in the main) uncomfortable with stated preference as compared with revealed preference. It will be important, in the workshop, to explore the value of the more general stated response techniques and, indeed, the value of the discovery of rule parameters in constraining outcomes. While we are uncomfortable with non-statistical models and measures, there is no reason to believe that because we cannot look at the goodness of fit statistics, non-statistical methods are inherently inferior to statistical methods. How well, or realistically the model can be specified, is probably as important as having a model which has good goodness of fit measures using variables whose coefficients leave much of the behavior unexplained.

3. LONGITUDINAL PANELS

Longitudinal panels can be the repeated survey of revealed behavior of the same respondents over time, as their situation or environment changes at a fixed time interval (e.g. every 6 months), or a study of revealed behavior before and after some anticipated change in the system.

It is possible that this kind of study is the only way to obtain data for models of “slow” decisions such as household location and auto acquisition/disposition choices. It is certainly true that this is the only source of revealed preference data for such “slow” decisions. This is also a source for modeling the effects of household transitions (births, deaths, marriage, children leaving home, new job). Its value as a source of information on daily travel choices is more problematical as changes in behavior over time occur as the result of many changes in stimuli. Just as cross-sectional revealed preference has limits on use of many variables that are of policy interest, due to correlation and confoundment, and a large part of the model representing unexplained variance (a reason for SP experiments), so do panels, with the addition of changing preferences over time probably exacerbating this problem.

The use of data of this sort for immediate application in activity models is limited to the use of already collected data. The length of time for development and deployment of this source of data is in the order of 5 or more years. A consideration for this conference is the utility of the use of existing panels (e.g., the Puget Sound survey which only has travel related activities), and the possible value of survey enhancement (in terms of geocoding, and the addition of needed transportation level of service, environmental and accessibility variables between and at household and activity locations). This raises issues of transferability (strongly linked to the enhancement grain — network, geocoding).

From the point of view of the advancement of activity-based forecasting, it would appear that the institution of a longitudinal panel of activity participation, travel and time use would be useful. A discussion issue here is the role of such a survey — to look at “slow” decisions only, to look at stability in activity participation

and duration (which could form a strong modeling base if there is temporal stability, and of course lead to model transferability) or to use it as a base for full information on travel decisions?

Another issue is the cost and continuing effort for these types of surveys. It is unlikely that most MPOs can find the political support for a large expenditure on something that has a delayed pay-off (beyond the political term limits of some states).

The final disadvantage is that the design and fielding of many such panels would stretch the skilled resources necessary to design and carry them out. Is it time to look at a national effort – and if so, would this be better as a few projects in well chosen cities, or would it be better to do a nationwide survey in the same way as the National Personal Travel Survey (NPTS)? Should it in fact be integrated with, or replace the NPTS?

Is it worth doing at all?

4. RETROSPECTIVE SURVEYS

This is an area that is not much discussed in transportation literature, however, given the new concern for long run effects of transportation infrastructure on land use and auto acquisition, this might be a fruitful alternative to longitudinal panels. The discussion of retrospectives versus panels is somewhat analogous to the RP-SP debate, only here it is revealed behavior versus stated behavior.

Issues here include: the determination of “true” frequency of the occurrence of the choice (analogous to choice based sampling); the survey of respondents who had not made such a choice, but might have considered it, to determine null response; and the determination of an acceptable retrospective time horizon for various actions of interest.

SURVEY ROLES AND INTEGRATION

Where do the various methods fit, what are their roles, how do we develop an integrated and coordinated approach to data in the short and long term?

I believe the essential base element is the household (or person) activity survey. This is needed, under the utility maximizing paradigm, for both model estimation and for calibration. It is also necessary for the calibration of rule-based heuristic satisficing model development. In the immediate short term, this is the only source of data available, and, in fact constrains the choice of activity models in the short term. The most obvious application is in activity pattern models that use utility maximization.

To date, true stated preference models have been largely limited to trip-based analysis. The consideration of stated response to generate rules and constraints for a satisficing approach would also appear to be a possibility. In terms of short term practicality, this would have to be a combined RP/SR on individuals (rather than households), where a base pattern is revealed and a concurrent stated response is used to

probe for both response and decision rules. A recent example of this approach is the Washington survey done as a part of the development of AMOS, which was limited to out of home activity patterns that included a work activity. That procedure could certainly be widened to include all activities, and to include non-workers. The model development could be completely heuristic, or hybrid, including utility elements. The model could in fact be calibrated/validated against the aggregate values from an existing household survey.

Perhaps the best example of a joint RP/SR survey that I am aware of, is the Adelaide Activity-Travel Questioner (ATAQ) - (Jones, Bradley and Ampt). This survey successfully demonstrated an activity approach that considered all family members and measured the effects of changes to the journey of one of them. It was also a computer based survey that was well ahead of its time. The thought that this example is ten years old is humbling. This example of the integration of RP and SR, with enhancement, might well form the basis of survey techniques for moving into fully informed activity modeling.

In the long run, the joint RP/SR will probably be used as the primary source of data for heuristic model development. In this case, the experiment can be widened to determine the non-constrained choice of activity pattern. This was suggested by Axhausen in his presentation at the Eindhoven conference.

A different and more direct approach is suggested by Ettema, Borgers and Timmermans in their description of the development of SMASH. This is a two-stage experiment:

In the first stage, the respondent details, for a list of activities, last occurrence (when), frequency (per month), time to perform (min. max. and average), the likelihood that this activity will be performed on a predetermined target day (next day), the need for performance with others and information on all known possible locations for this activity. The respondent is also asked to enter travel times for available modes between each pair of activity locations identified. This data was collected in a personal interview using an interactive computer procedure (MAGIC).

In the second stage the respondents were asked to build an activity schedule (interactively), for the following day. All of the information about the development of the activity pattern was recorded by the program, which included checks for feasibility, activity overlap, and time used (by the scheduler). This data was then used to build a model of the activity scheduling heuristics. This kind of approach (determining the revealed choice process) would also appear to provide some promise in the future. Again, application and calibration/validation against the aggregate values from a revealed preference activity pattern would be appropriate.

Both the ATAQ and SMASH examples make use of interactive computer interviewing, with great success. Given the current capability of laptops, it is hard to justify using paper diaries and CATI or mail-back -- complex diaries, with the need for good literacy, lead to obvious response bias problems.

Longitudinal panels offer little in terms of short term application, but much in understanding revealed response to changing situations. For “slow” decisions such as location choice, they are a possible source of revealed data. Given that stated response is assumed to be more suspect when applied over long time horizons, this becomes important. As the questions on joint interaction between land use, activity space and

transportation become more insistent, and the need to model, or evaluate this interaction is needed, the need for panel data will be real. This is perhaps, the hardest “sell” in terms of a research objective.

Retrospective surveys may be a viable alternative to panels for understanding slow response decisions, and may certainly yield results in a more timely and less expensive manner than panels, research is needed here to determine valid retrospective time horizons, among other issues.

DATA COLLECTION METHODS

A plea!

The Irvine conference on household surveys brought to the fore issues of non-response and biased samples. Our experience in Portland with a relatively complex activity survey shows a much worse than expected non-response bias (both household and item). There has been a direction in the US that has moved us away from in-home surveys and towards mail-back and telephone. We have put more value on quantity than quality. With a section of the population being functionally illiterate, the use of written diaries does not make sense, as an example, the Portland survey has a good sample of the very literate, as a look at reported occupations discloses. The answer does not lie in simplifying the questions, (we would still have some problems), the illiterate and semi-literate have lives, activities and travel, and make the same kind of behavioral decisions as others – we need to get their input, and in the same detail!

We should seriously evaluate the use of more carefully chosen, smaller samples, using direct contact and paying for cooperation (their time). Data collection needs to be automated (laptops etc.), and we need to design interactive stated response experiments that key directly from revealed data at the same collection time. There are examples of this approach outside the US.

I would also pose a heretical question, is it time to consider surveying a single person from each household?

We are looking for complex information on revealed and stated response which increases the household response load. Does the increased household load lose more than is gained in explicit household member interaction? The alternative might be to space the household members over several days, or use multiple interviewers. The ATAQ survey suggests a practical in-between approach where detail was collected on all members, the changes were applied to the major traveler and responses of other members were collected if the responses of the major traveler would affect their pattern. However the main respondent was always an auto driver, so that the collected trip characteristics were relatively simple.

If we move to direct contact surveys, we may also want to depart the flawed world of random digit dialing samples.

CONCLUSIONS/OPINIONS

My conclusions are that both revealed household activity (cross-sectional) and stated response techniques are needed for near term activity model development. In the case a study area with no existing household survey, the fielding of the revealed and stated response should be a joint (and simultaneous) exercise. For regions with an existing (current) household survey, stated response will still be necessary to answer many policy issues, although the scope may be less onerous. This joint approach gives much more information for the development of better utility maximizing models and is essential for the development of microsimulation models.

The limitation of data to household cross-sectional will also probably limit model development to utility maximization, and raise issues of temporal truth. However, in my opinion, activity pattern, or travel pattern based models using utility maximization are preferable to trip based models, and would represent a considerable improvement over current practice.

I am also of the opinion that it is time to consider smaller samples of households, with real compensation for the level of effort, together with the use of direct contact surveys utilizing interactive computer based techniques.

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The opinions and conclusions drawn remain the responsibility of the author.

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